Site Planners

Properly situated homes pay big dividends

The National Association of Home Builders (NAHB) estimates that 1.6 million new homes will be built each year over the next decade (NAHB 2002a). How these new developments are designed will have a major impact on energy use, the environment, and customer satisfaction.

Developers and site planners can set the stage for efficient communities and can direct builders to protect a community's value through quality building practices.

The sun is the main source of heat in all homes. By looking at how houses receive sunlight, site planners can help optimize how much solar energy is available to heat a house, and how much heat must be removed with air conditioning.

In the hot and humid climate, planners should do all they can to avoid the entry of solar energy into houses, especially in summer. Site planners have two important tools to help avoid solar heat gain: **lot orientation** and **shade trees**.

Lot Orientation

As planners map out lots and roads, the relationship between buildings and the sun should be key. Just as you lay out roads to allow houses to take advantage of great views, or to work around hillsides and other landscape features, also consider how road design, lot lines, and orientation will influence the way that houses face the sun.

Lot lines and roads should be situated to minimize home exposure to east and west. These orientations provide the greatest solar heat gains. Plan your subdivision so that the longer sides of the houses will face north or south. Single-family homes tend to have longer fronts and backs and narrower sides, so lots facing north or south are preferred. Streets should be positioned in an east-west direction. The Florida Solar Energy Center (FSEC – see additional resources below) estimates that proper orientation can result in substantial savings of heating and cooling costs, depending on specific site conditions and house designs. Highly efficient houses, especially when good windows are used, are less dependent on orientation and shading to manage solar gain. With proper planning, there may be no added costs to the builder for good orientation.

When the house has clear single glazing, which is not recommended, interior shades, overhangs and typical combinations of shading devices significantly reduce energy costs. Naturally, a completely shaded house has the best performance in a hot climate.

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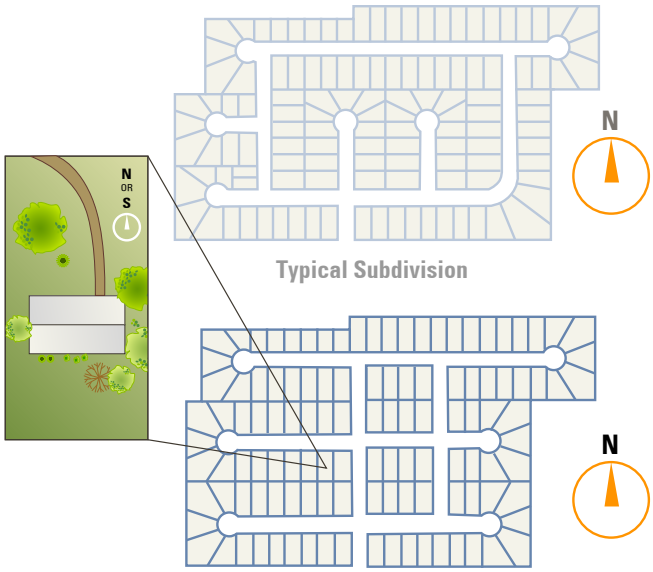
- Lots facing north or south are preferred to manage heat gain from the sun, so position streets to run east and west.
- Preserve trees for shade and breezes.
- Take advantage of natural breezes from lakes, the ocean, or other geographical features.
- Properly grade your development to take water away from structures.
- Use sustainable building practices.

Shading is not nearly as important when windows with a low solar heat gain coefficient (i.e., SHGC of 0.35 or less) are used. Using a low-solar-gain low-E coating results in great energy cost reductions for all conditions even with no shading. This is because the glazing itself provides the necessary control of solar radiation, so these additional measures become less important in terms of energy use. For a description of the interactions between window performance and shading, see the Efficient Windows Collaborative Web site at: www.efficientwindows.org.

FIGURE 1: Plan subdivision lot lines and roads for predominantly north and south orientation



Source: Viera et al. 1992. p.3-5

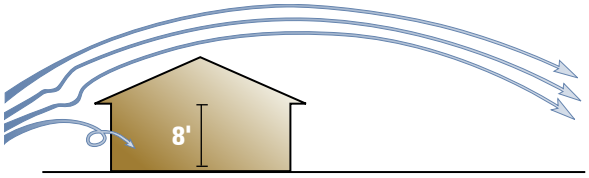
Lot orientation is especially important if solar heating or electric generation systems are planned. Inexpensive tools can help assess how much solar energy will be blocked by obstacles on a particular site. Low-cost tools for solar assessments are described in the *Designers* chapter in the section about windows.

In addition to helping manage the sun and providing a marketing advantage, proper street design can reduce the environmental impacts of runoff, encourage walking and bicycling, and discourage speeding by through-traffic.

Subdivision planning can also help to gain cooling benefits from the wind. Houses and other buildings that are tightly packed may create a wake in the wind that is four to five times the buildings' eave height.

Curved streets and staggered lots can assist in preventing wind disturbance. Trees can help to keep breezes cool as described in the next section. Taking advantage of breezes will reduce cooling costs. Wind conditions at any individual site may differ considerably from regional averages. Local geography such as ocean beaches, lakes, fields, golf courses, parks, and malls can influence local breezes.

FIGURE 2: Wind wake of a typical house



Source: Viera et al. 1992. p.3-7

Shade Trees

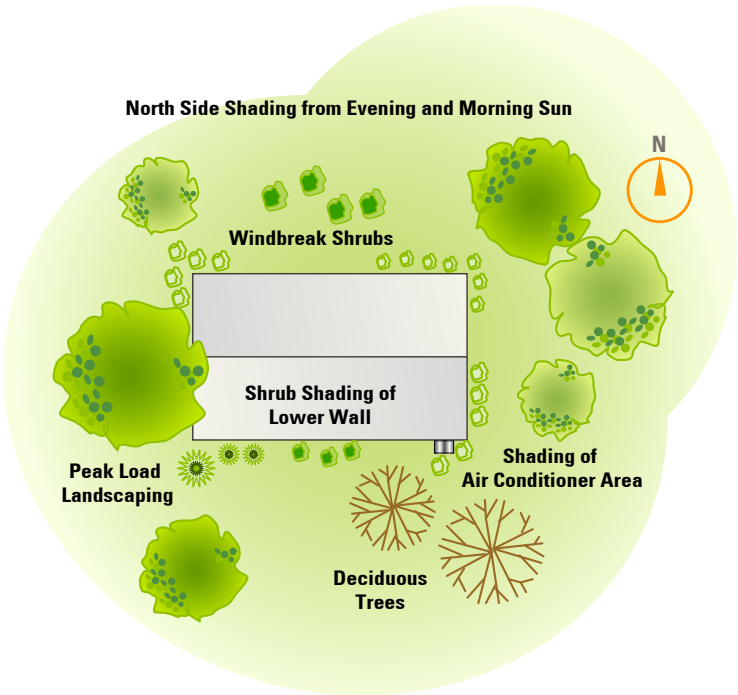
Tree preservation brings many benefits, one of which is increased salability. Native trees are most beneficial to the environment. The NAHB reports in its survey of buyers, *What 21st Century Homes Buyers Want*, that over 80% of respondents in the South rated trees as essential or desirable (2002b, page 61). In 1992, the Florida Solar Energy Center (FSEC) estimated that a treed lot may increase the value of a home by as much as 20%. American Forests and the NAHB (1995) found that mature trees may add from $3,000 to $15,000 to the value of a residential lot.

Trees also bring value by providing shade. It is far better to prevent solar energy from reaching a house than to attempt to manage it once it enters. Deciduous shade trees block summer sunlight before it strikes windows, walls, and roofs, dissipating absorbed heat to the air where it can be carried away by the breeze.

Truly cool neighborhoods have trees. A study in Florida has shown that a subdivision with mature trees had cooler outside air with less wind velocity than a nearby development without trees (Viera et al. 2000). The development with a tree canopy had peak afternoon temperatures during July that were 1.1°F to 3.1°F (± 0.7°F) cooler than the site without trees. The total effect of shading, lower summer air temperature, and reduced wind speed can reduce cooling costs by 5% to 10% (McPherson et al. 1994).

Trees are most effective when located next to windows, walls, and air conditioners, and when located on the side of the home receiving the most solar exposure. Shade to the southwest and west is especially important for blocking peak solar gain in the summer in late afternoon. Trees more than 35 feet from the structure are probably too far away for shade.

FIGURE 3: Configuration of shade trees



Source: Viera et al. 1992. p.3-8

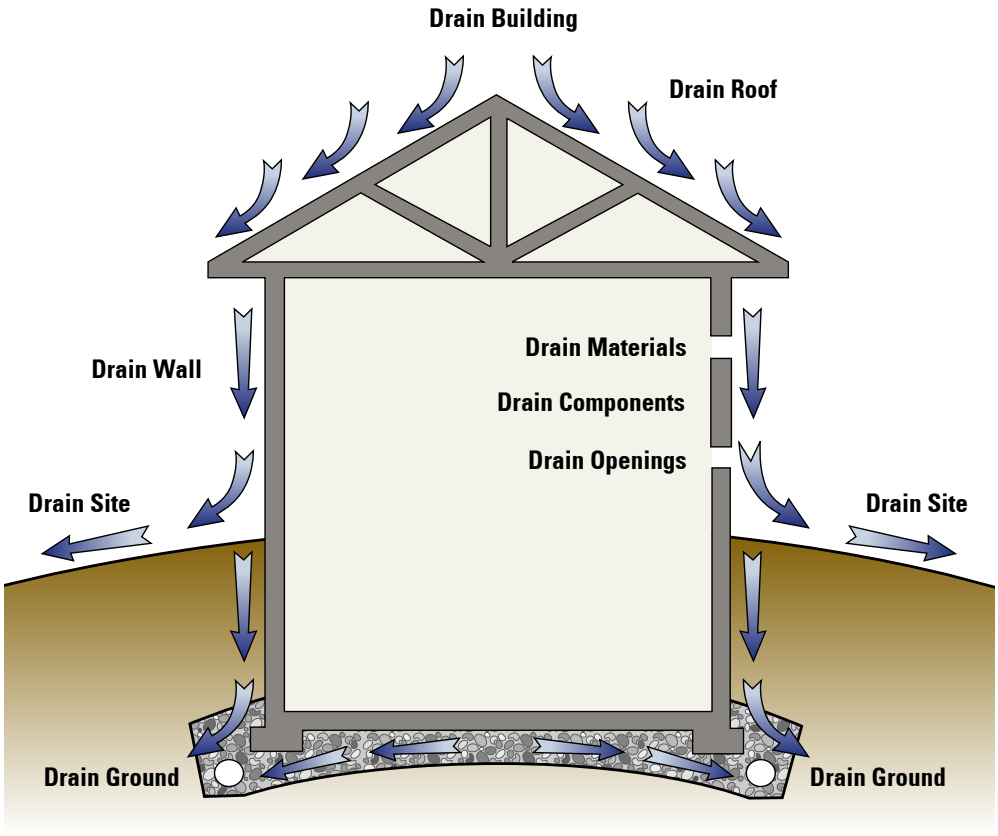
Other Steps

In addition to orientation and the use of trees, many other steps can be taken during site planning to make developments user and earth friendly.

Site Grading

Proper site grading directs surface water away from building foundations and walls. The steeper the slope away from the building, the better the water will drain. Floor levels should always be above the surrounding grade. Basement floors should be higher than the surrounding drainage system. Driveways, garage slabs, patios, stoops, and walkways should all drain away from the structure. See EEBA's *Water Management Guide* (Lstiburek 2003) for more information. Additional information on moisture management is also available in the *Designers* chapter.

FIGURE 4: Drain all water away from the structure



Source: Lstiburek, J.W. 2003. p.4

"What we tell buyers is that we sell value…it's about high standards in every aspect of home building…The whole idea is to get builders all over the country more concerned about building this way—it's about energy efficiency, indoor air quality, waste recycling, water recycling, better planning—it all leads to better development."

GW Robinson,
President of GW Robinson

Sustainable Development

Builders who choose to advertise their "green" designs have found that buyers are willing to pay for environmental features.

Features that help to conserve the natural environment can include:

- Orienting lots to best manage energy and light from the sun.
- Land planning that preserves the natural environment and minimizes land disturbance.
- Site design that minimizes erosion, paved surfaces, and runoff.
- Preserving and protecting trees and natural vegetation.
- Conserving water indoors and out.
- Designing energy efficiency into houses.
- Selecting materials that are durable and recyclable, or created from recycled products, and considering the energy that goes into making products.
- Recycling construction materials and reducing on-site waste.

Good places to start on sustainable development are found in the Southface Energy Institute's *Sustainable Design, Construction, and Land Development: Guidelines for the Southeast* (Brown 2000), the NAHB's *Building Greener: Building Better: The Quiet Revolution* (NAHB 2002c), and the Sustainable Building Council's *Green Building Guidelines* (SBIC 2003).

G.W. Robinson pipes recycled irrigation water to cut water use and costs to homeowners at the Cobblefield development in Gainesville, Florida.

Sources and Additional Information

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- Viera, R.K., K.G. Sheinkopf, and J.K. Sonne. 1992. *Energy-Efficient Florida Home Building*, third printing. Florida Solar Energy Center, FSEC-GP-33-88, Cocoa Beach, Florida.